US012059048B2

(12) **United States Patent**
Teetzel et al.

(10) **Patent No.: US 12,059,048 B2**
(45) **Date of Patent: Aug. 13, 2024**

(54) **HEADGEAR SHROUD ASSEMBLY**

(71) Applicant: **Wilcox Industries Corp.**, Newington, NH (US)

(72) Inventors: **James W. Teetzel**, Portsmouth, NH (US); **Gary M. Lemire**, Lee, NH (US)

(73) Assignee: **Wilcox Industries Corp.**, Newington, NH (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 141 days.

(21) Appl. No.: **17/500,684**

(22) Filed: **Oct. 13, 2021**

(65) **Prior Publication Data**

US 2022/0202126 A1 Jun. 30, 2022

Related U.S. Application Data

(60) Provisional application No. 63/092,140, filed on Oct. 15, 2020.

(51) **Int. Cl.**
A42B 3/04 (2006.01)

(52) **U.S. Cl.**
CPC ***A42B 3/042*** (2013.01); ***A42B 3/0406*** (2013.01)

(58) **Field of Classification Search**
CPC .. A42B 1/24; A42B 1/242; A42B 3/04; A42B 3/0406; A42B 3/042; A42B 3/0426; A42B 3/0433; A42B 3/044; A42B 3/0453; A42B 3/0466; A42B 3/18; A42B 3/185; A42B 3/20; A42B 3/22; A42B 3/221; A42B 3/222; A42B 3/223; A42B 3/225; A42B 3/227; A42B 3/228; A42B 3/30; F41H 1/04; F41H 1/06; F41H 1/08; G02B 23/125
USPC 2/422, 424, 6.2
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,219,370	B1 *	5/2007	Teetzel	A42B 3/042 2/6.2
9,775,395	B2 *	10/2017	Teetzel	A42B 3/042
10,264,840	B2 *	4/2019	Teetzel	A42B 3/042
2010/0175172	A1 *	7/2010	Dempsey	A42B 3/042 2/422
2011/0072562	A1 *	3/2011	Prendergast	G02B 27/0176 89/926
2015/0026872	A1 *	1/2015	Giroux Bernier	A42B 3/04 29/428
2015/0074878	A1 *	3/2015	Teetzel	A42B 3/04 2/422
2015/0282549	A1 *	10/2015	Lebel	A42B 3/042 2/422

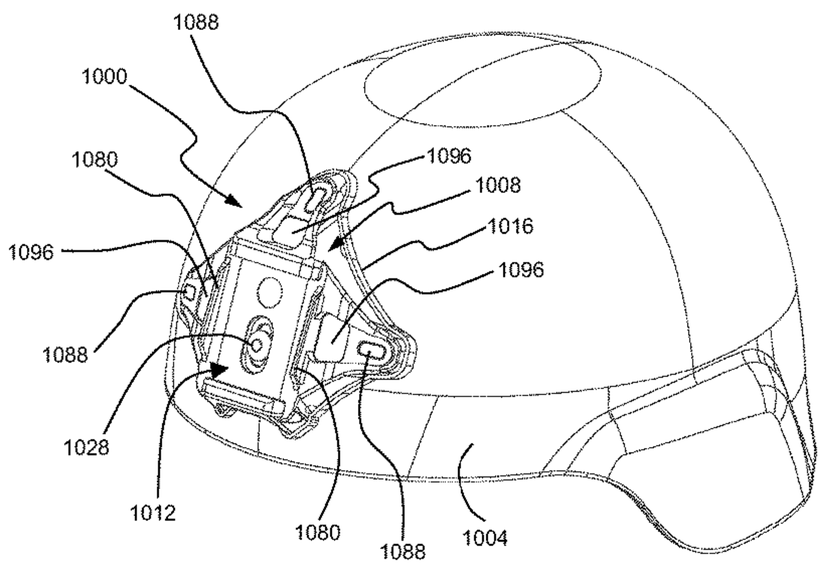
(Continued)

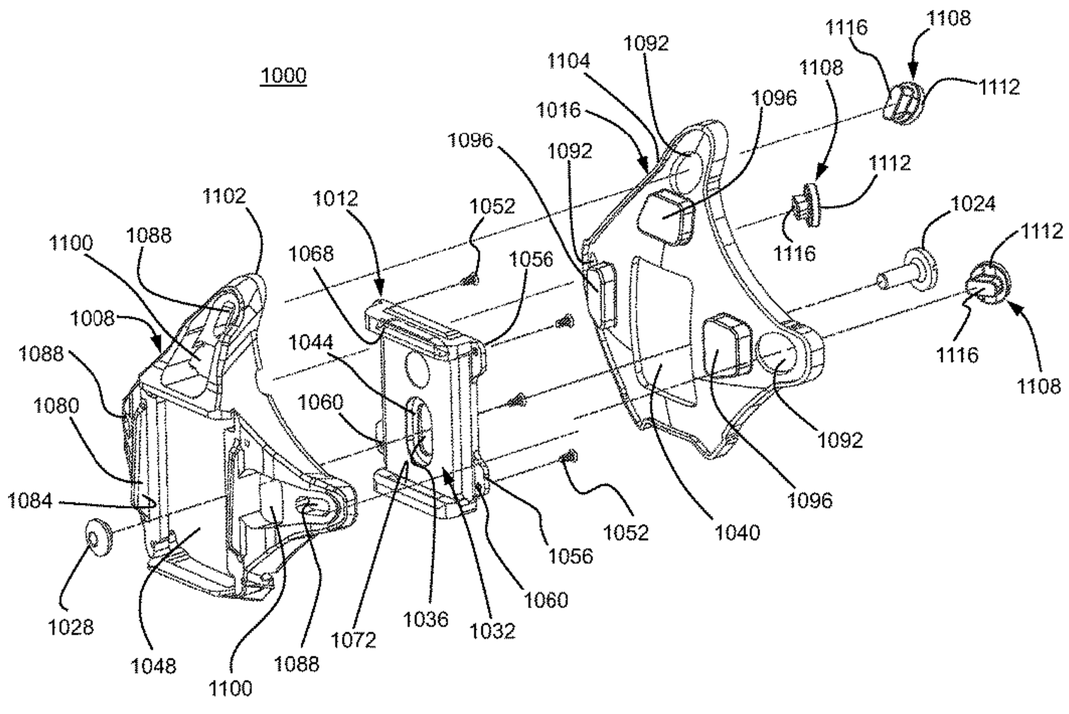
Primary Examiner — Jameson D Collier
Assistant Examiner — Matthew R Marchewka
(74) *Attorney, Agent, or Firm* — McLane Middleton, Professional Association

(57) **ABSTRACT**

A shroud assembly for headgear includes a frame having a first side configured to face toward an exterior surface of the headgear and a second side opposite the first side and configured to face away from the headgear, the first side having a shape that matches a contour of the headgear. An insert separately formed from the frame is removably attached to the first side of the frame, the insert configured for removable attachment to a mounting assembly. The frame includes first and second spaced apart walls disposed on the front side of the frame on opposite sides of the insert, the first and second walls spaced a sufficient distance apart to provide an interference fit between the mounting assembly and the first and second spaced apart walls.

29 Claims, 16 Drawing Sheets





(56) **References Cited**

U.S. PATENT DOCUMENTS

2017/0049176	A1*	2/2017	Giroux Bernier	A42B 3/04
2020/0205505	A1*	7/2020	Kim	A42B 3/185

* cited by examiner

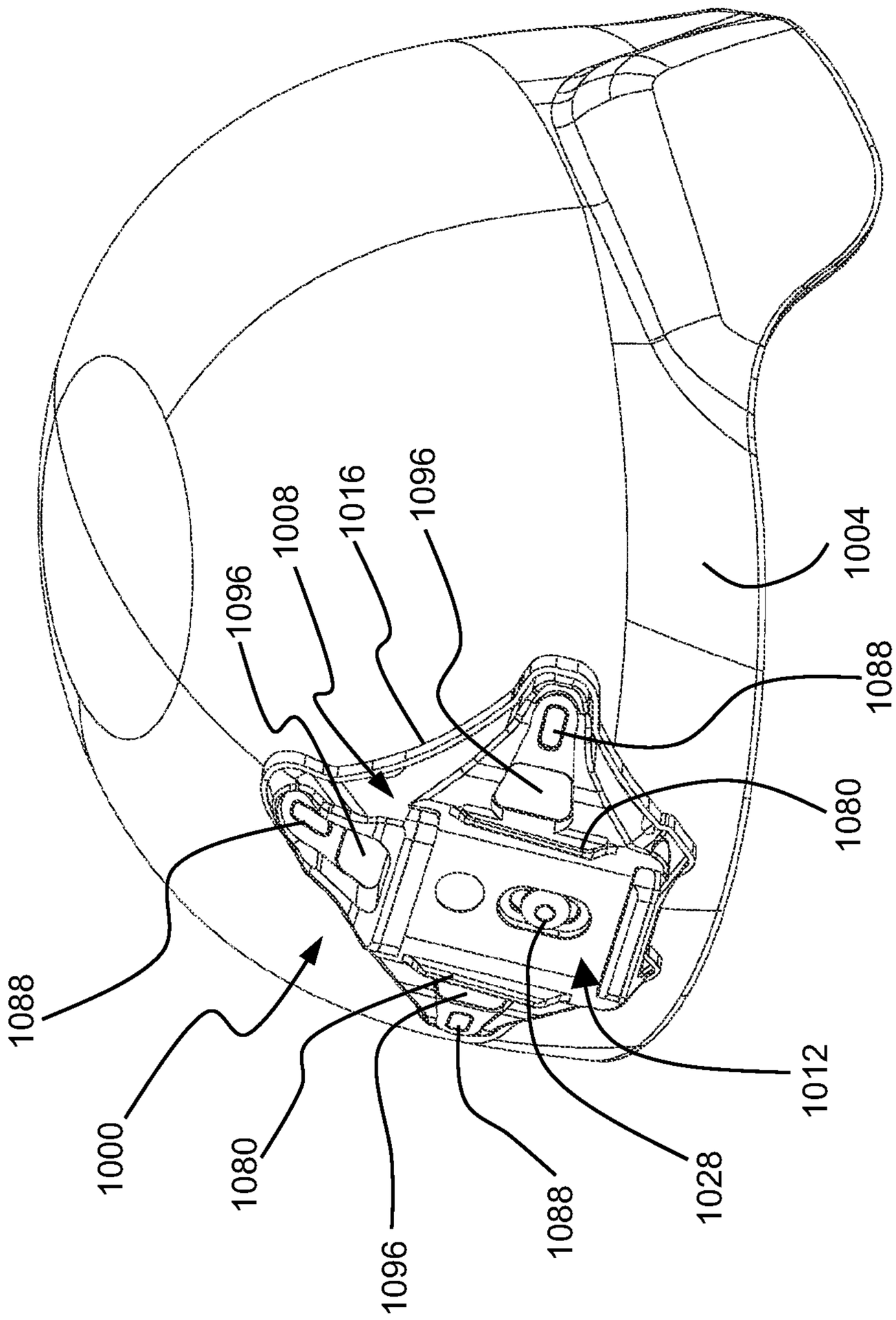

1088
1000
1080
1096
1008
1016
1096
1096
1088
1004
1080
1088
1028
1012

FIG. 1

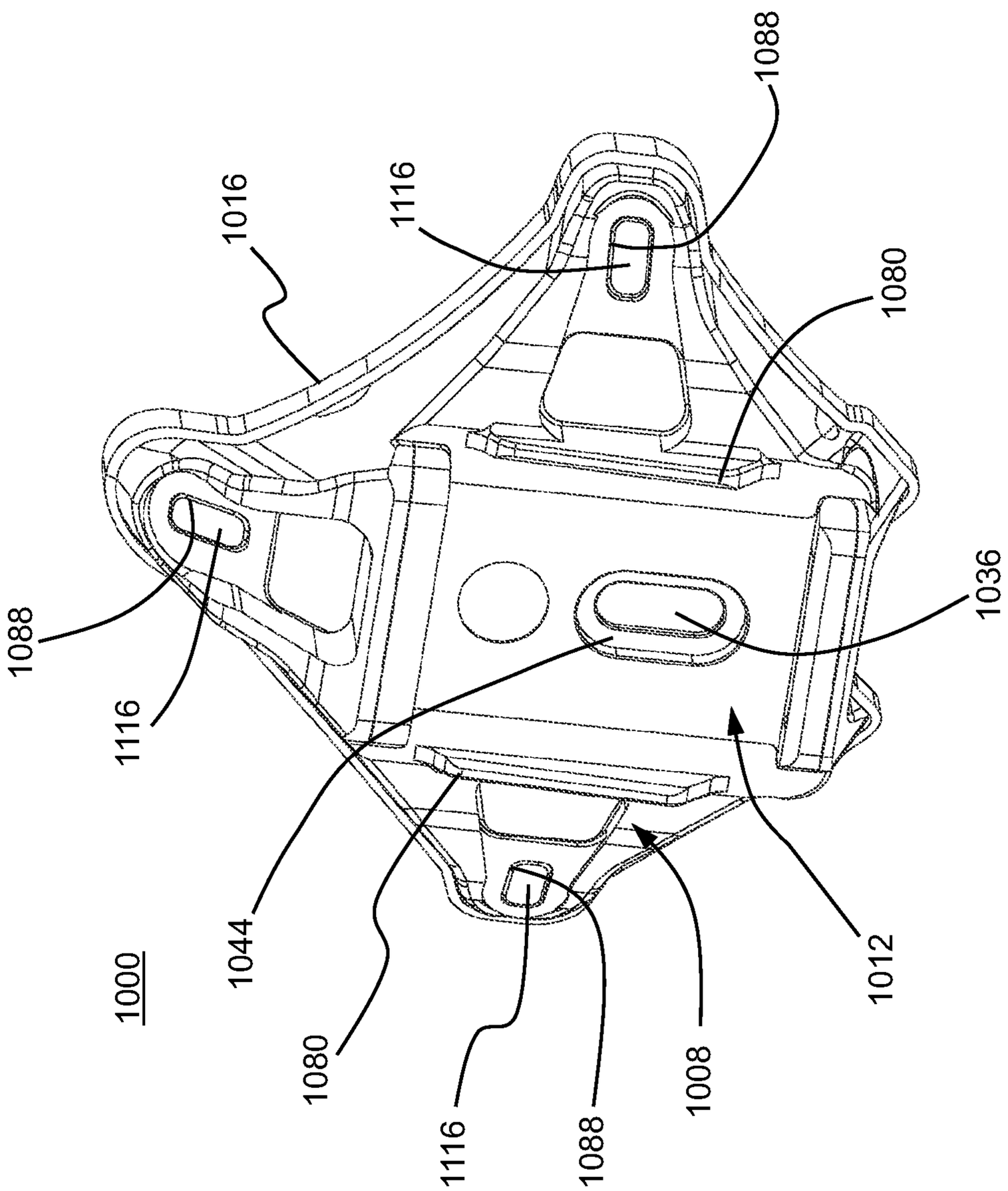


FIG. 2

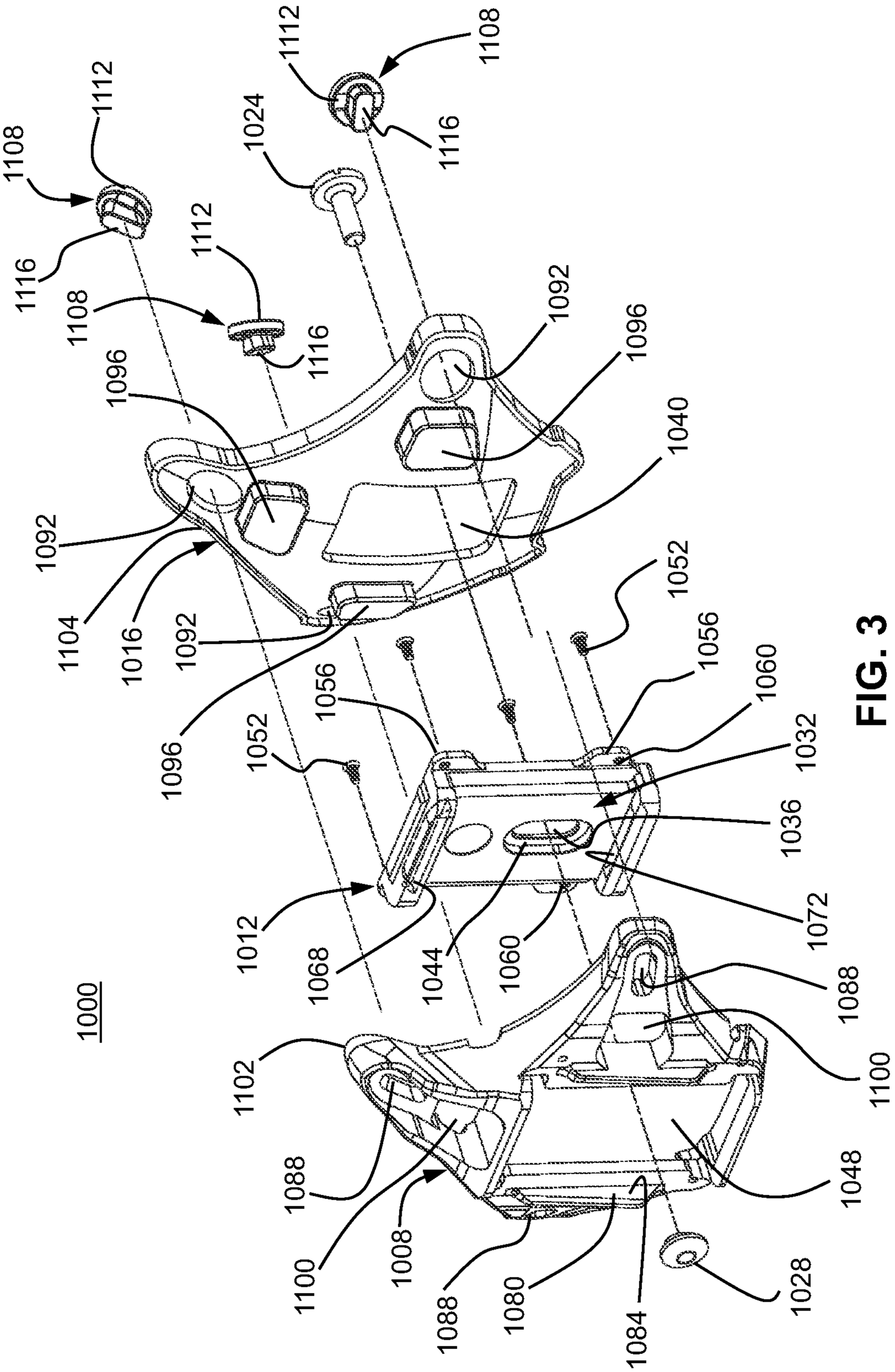

1000
1108
1112
1116
1024
1092
1096
1040
1052
1056
1060
1032
1036
1072
1088
1100
1048
1028
1080
1084
1008
1044
1068
1012
1102
1104
1016

FIG. 3

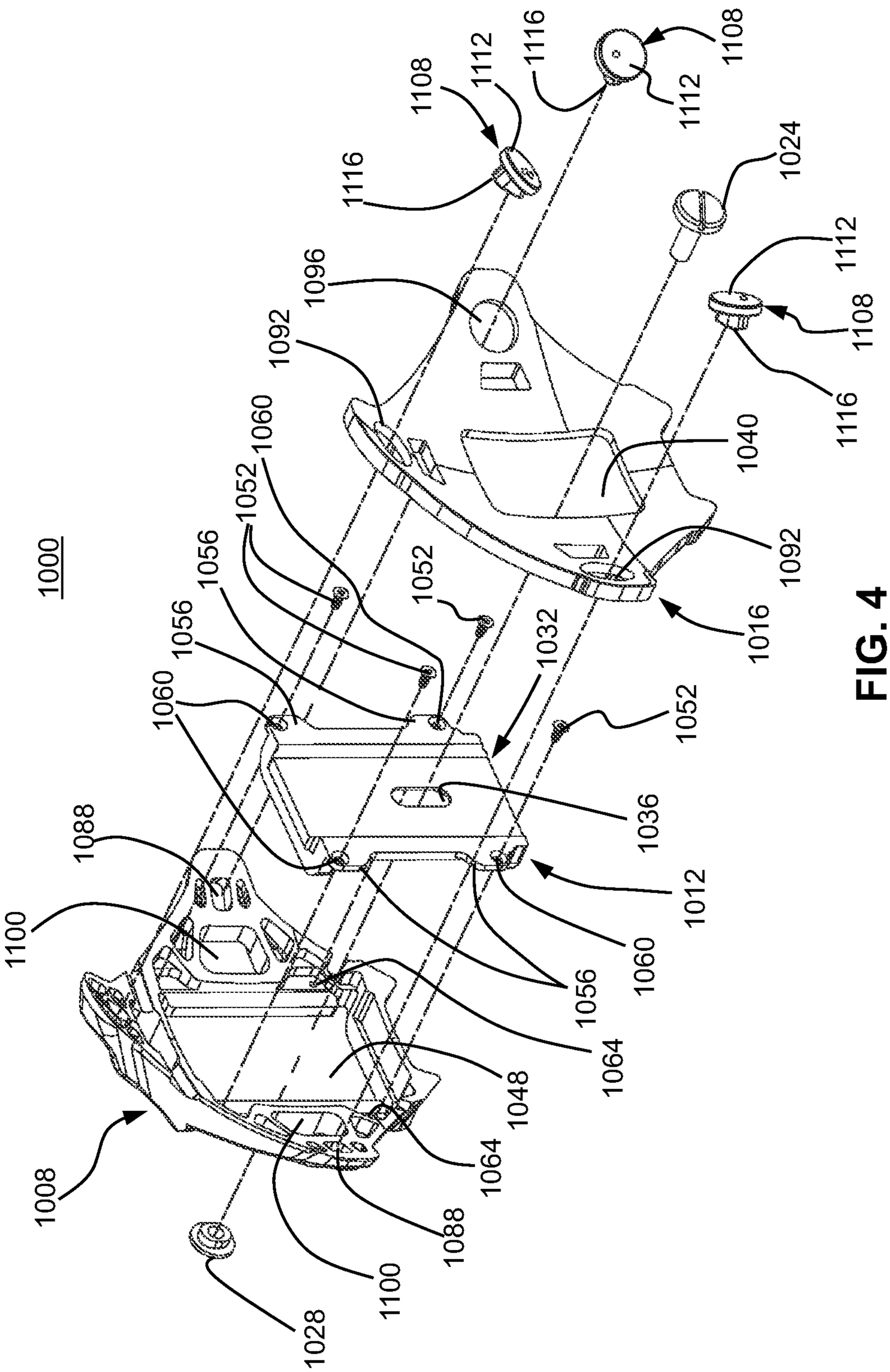

1000
1008
1016
1028
1032
1036
1040
1048
1052
1056
1060
1064
1088
1092
1096
1100
1108
1112
1116
1024
1012

FIG. 4

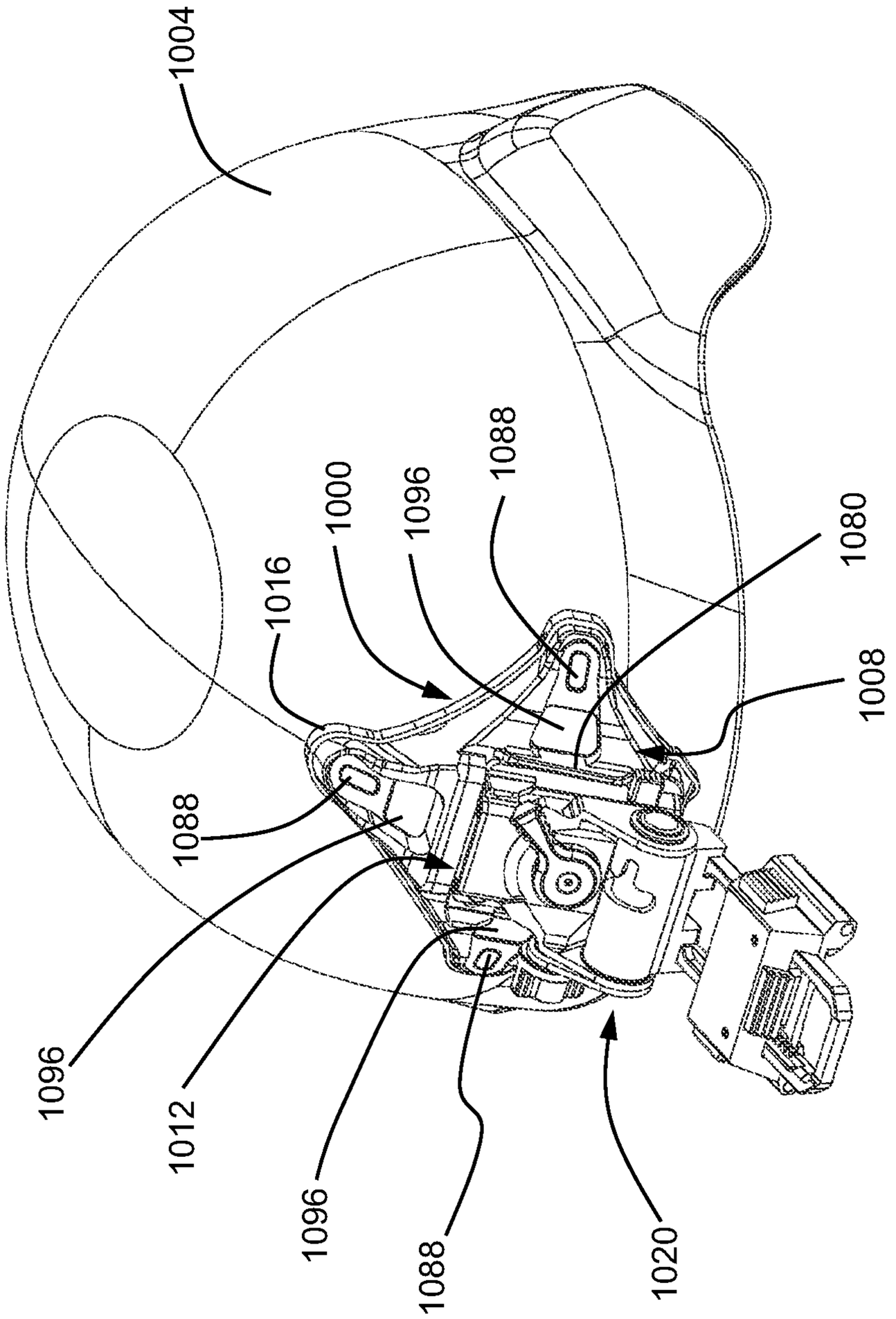

1004
1016
1000
1096
1088
1080
1008
1088
1096
1012
1096
1088
1020

FIG. 5

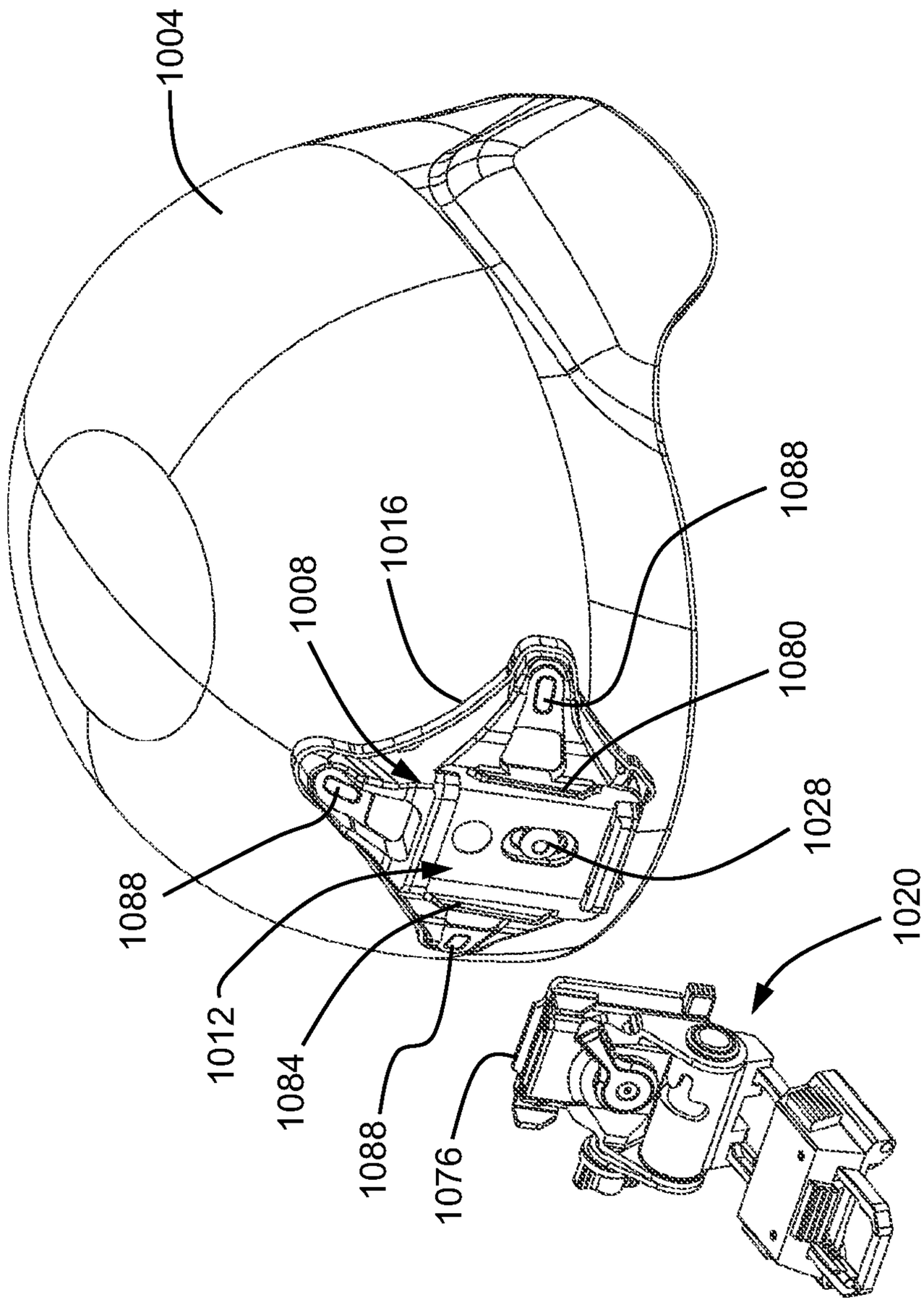


FIG. 6

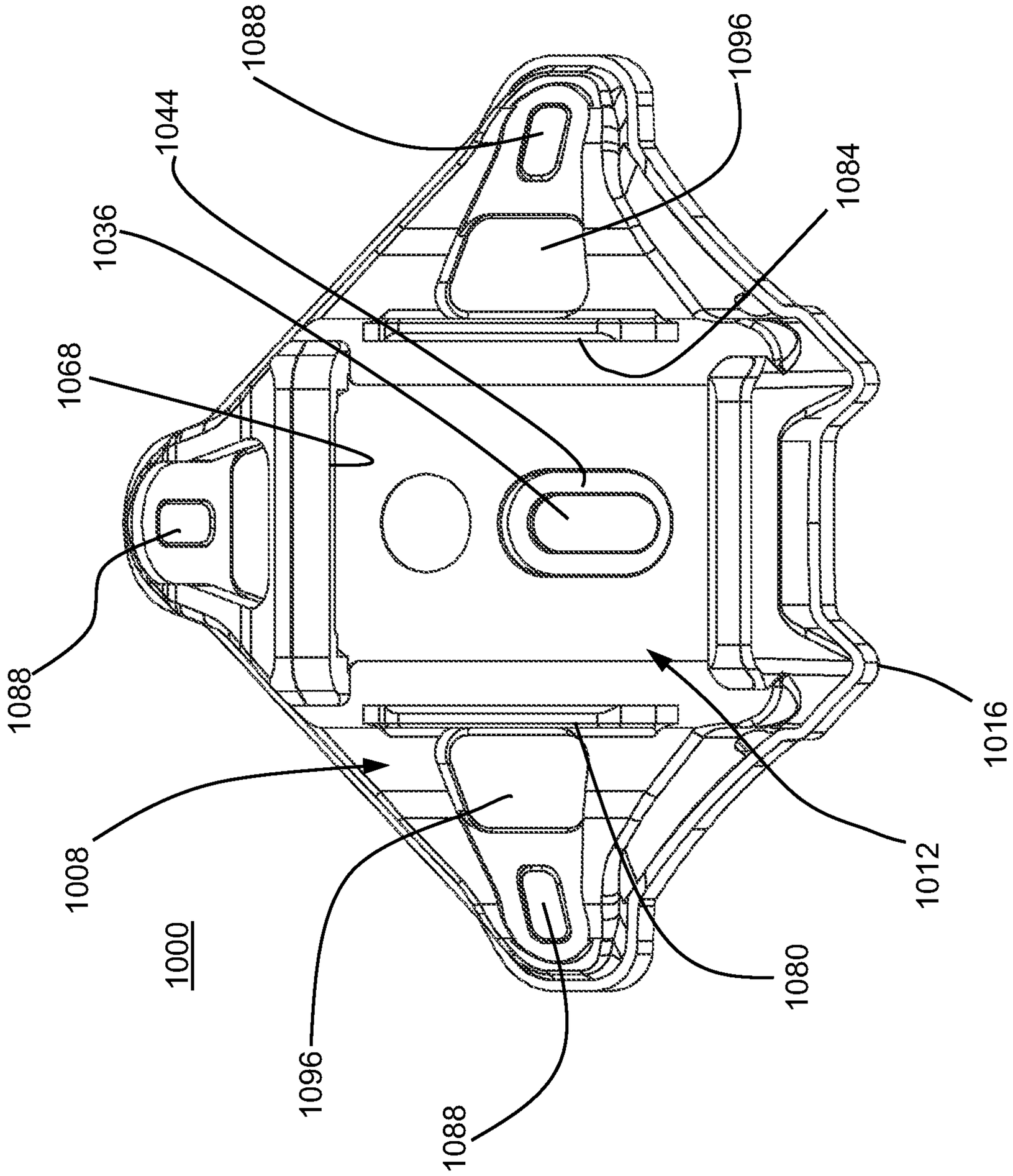

1088
1096
1044
1036
1084
1068
1088
1016
1008
1012
1000
1096
1088
1080

FIG. 7

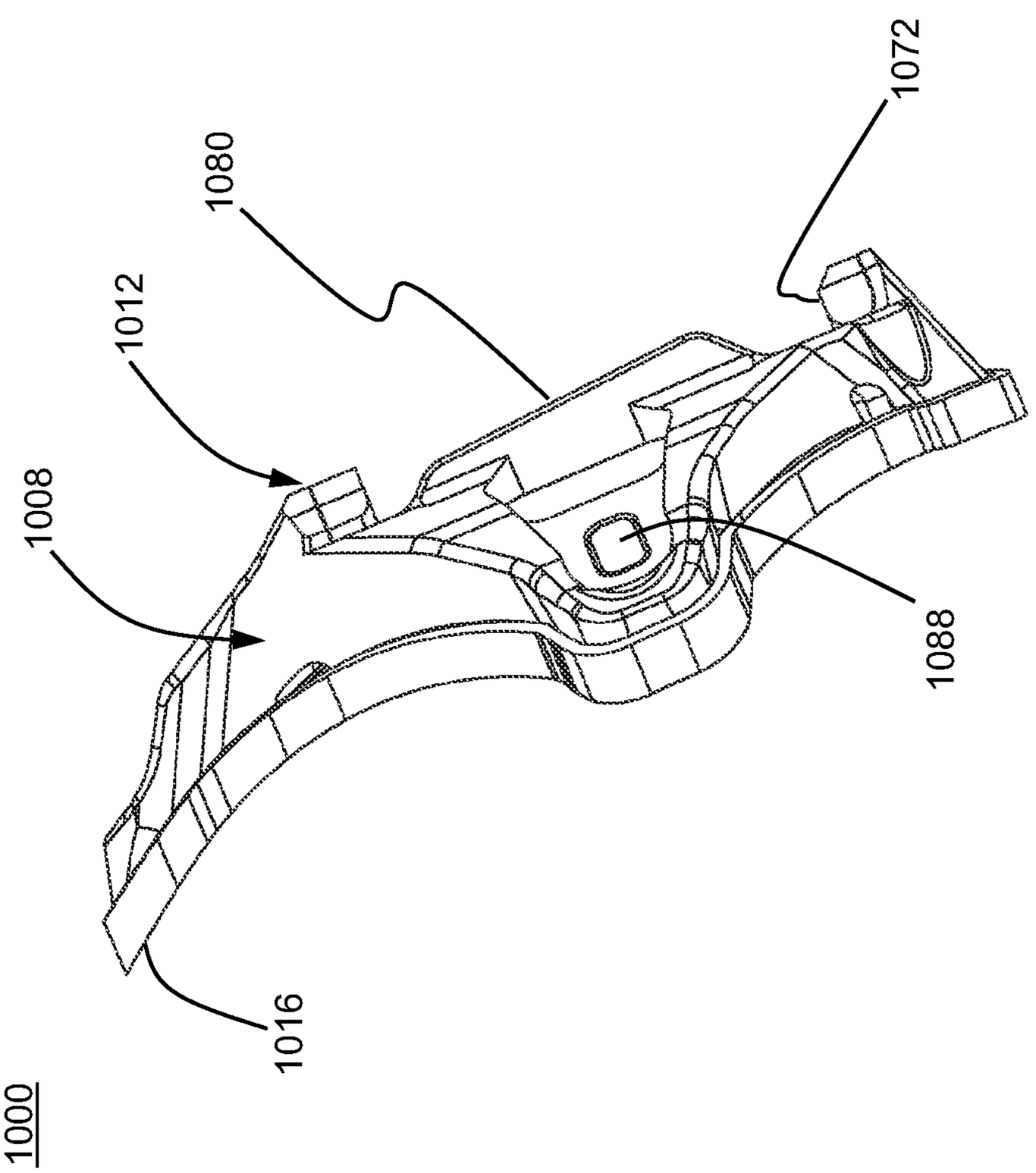


FIG. 8

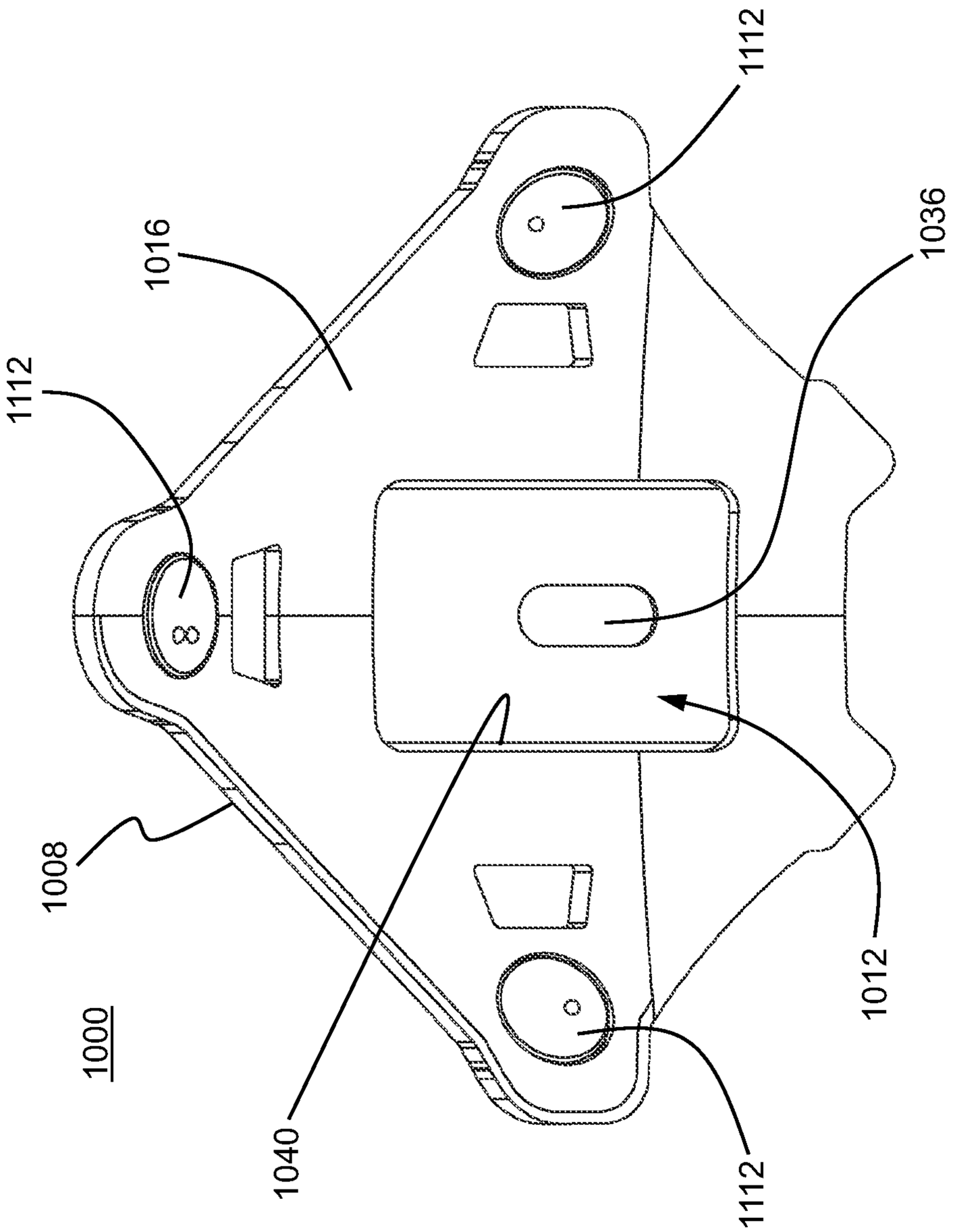


FIG. 9

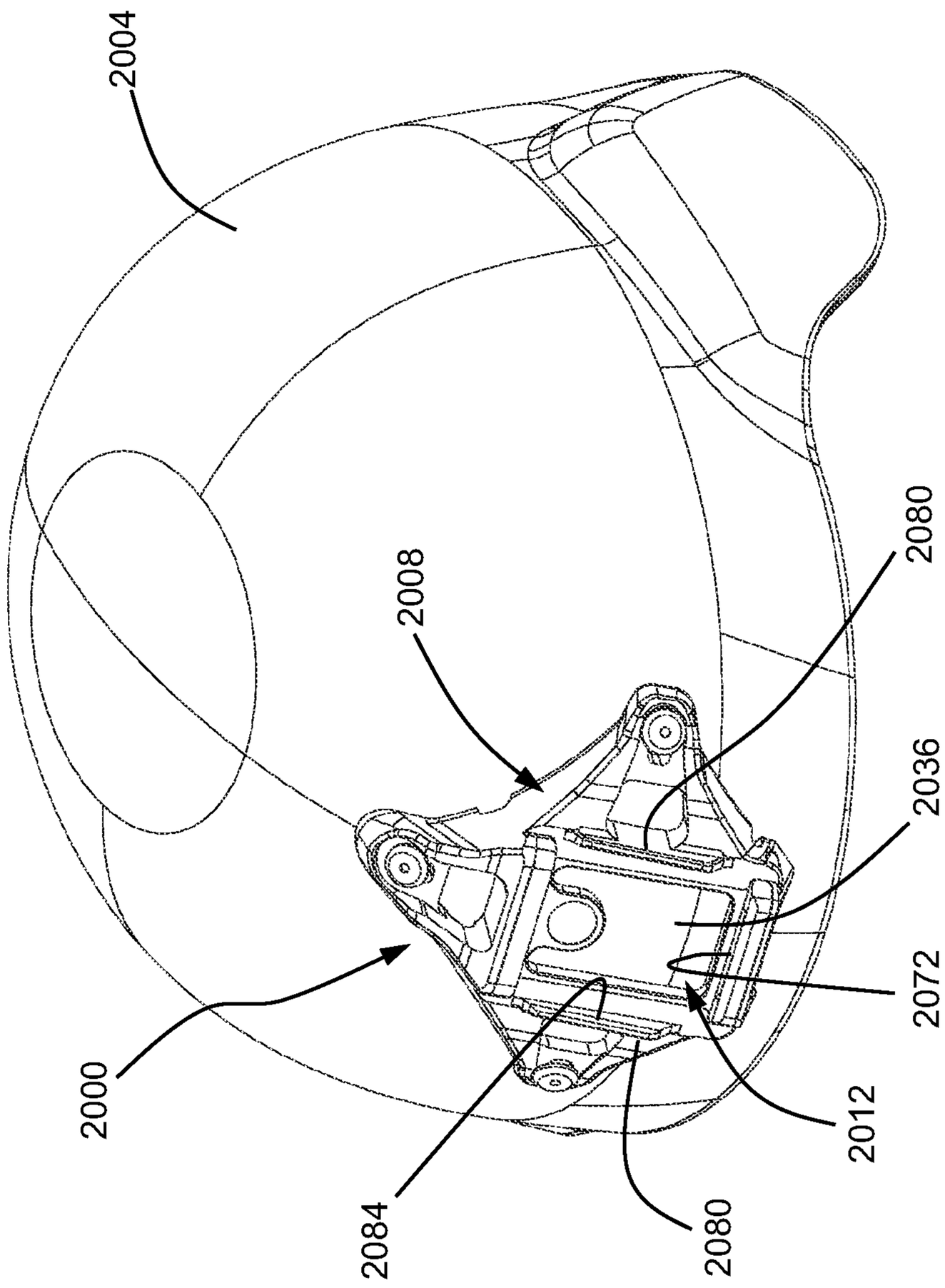


FIG. 10

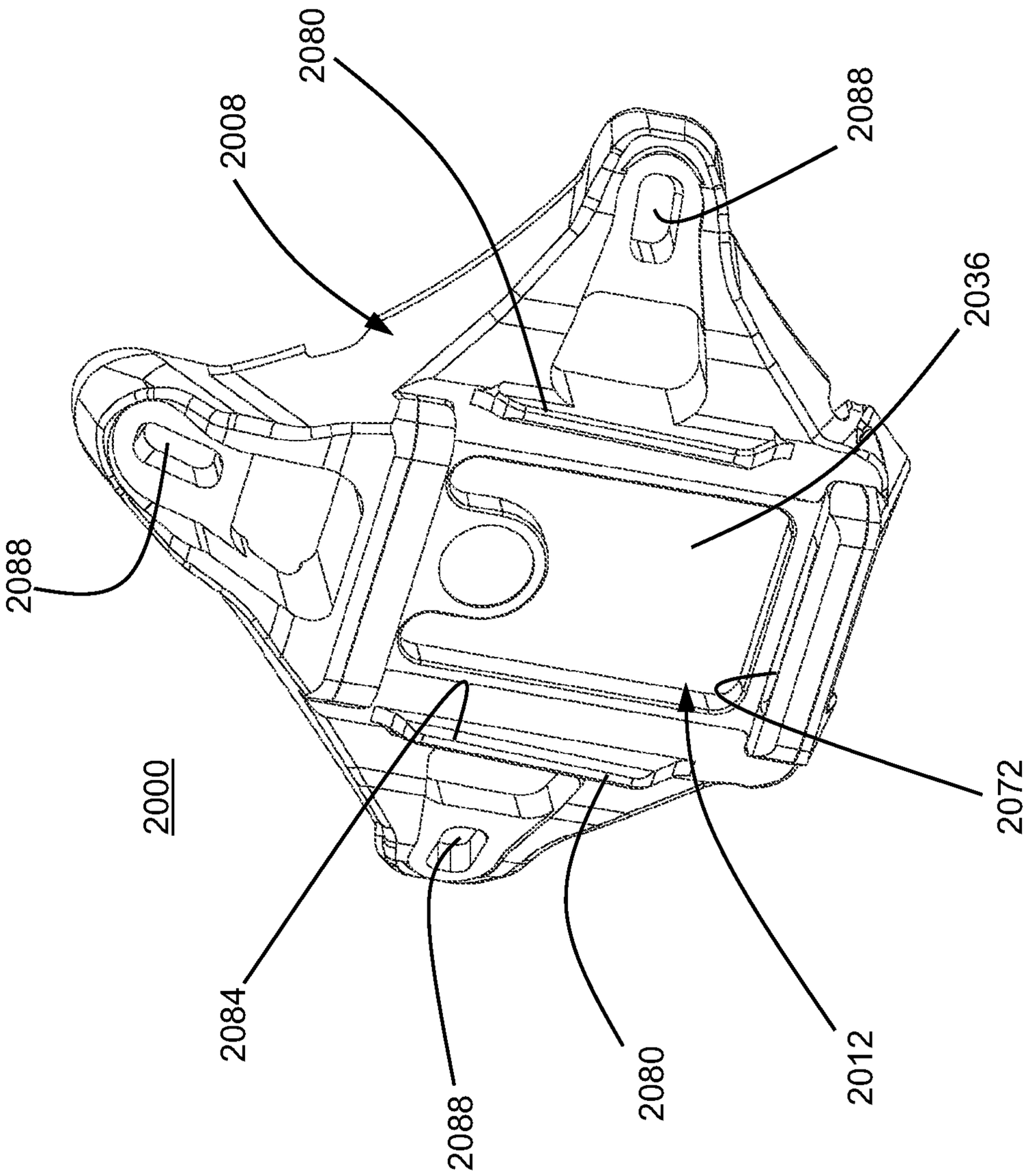


FIG. 11

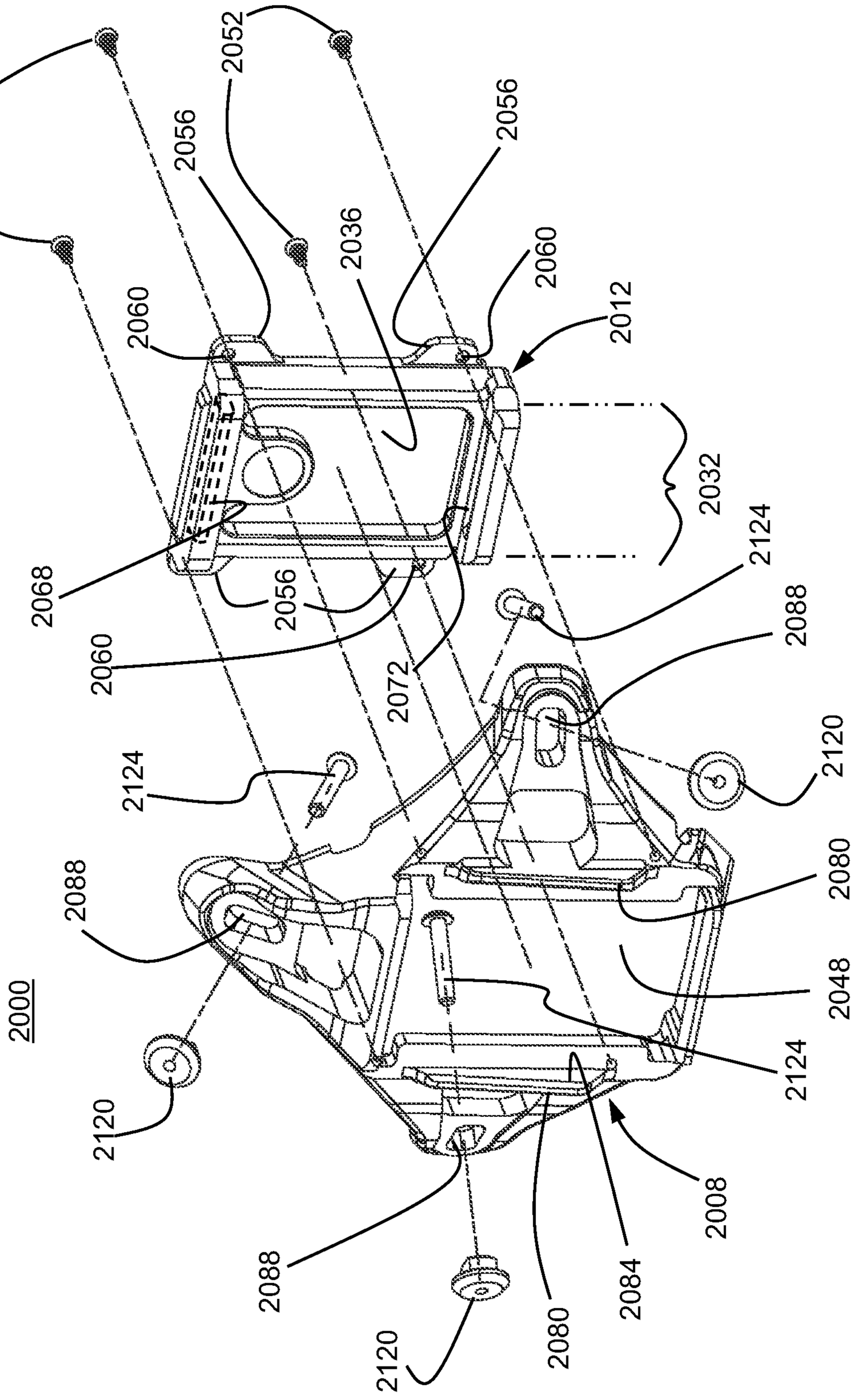

2000
2052
2056
2052
2056
2036
2060
2060
2012
2032
2068
2056
2060
2124
2088
2072
2088
2124
2120
2080
2048
2120
2124
2080
2084
2008
2088
2120

FIG. 12

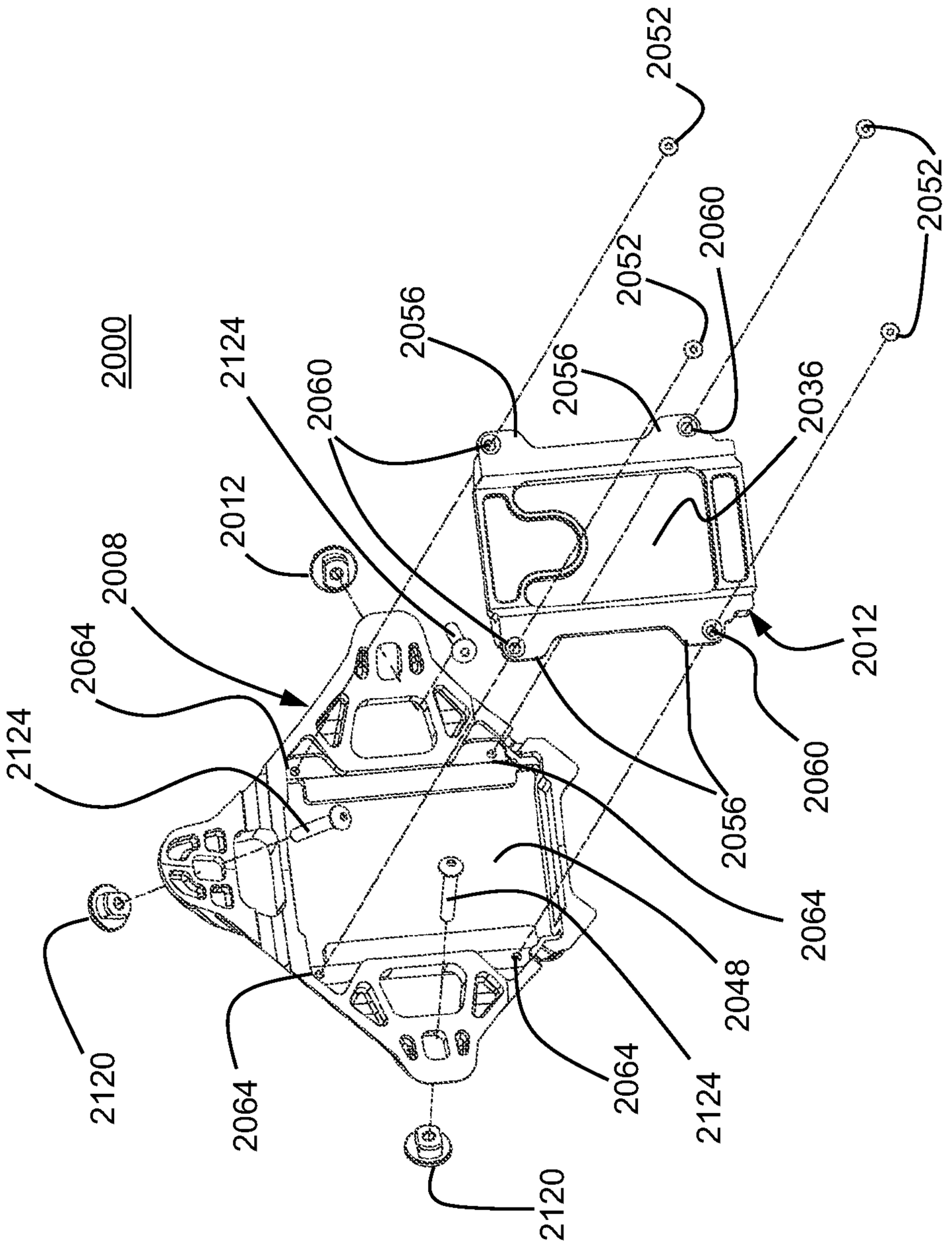

2000
2120
2064
2124
2008
2064
2012
2124
2060
2056
2052
2060
2052
2056
2036
2012
2060
2056
2064
2048
2064
2124
2120

FIG. 13

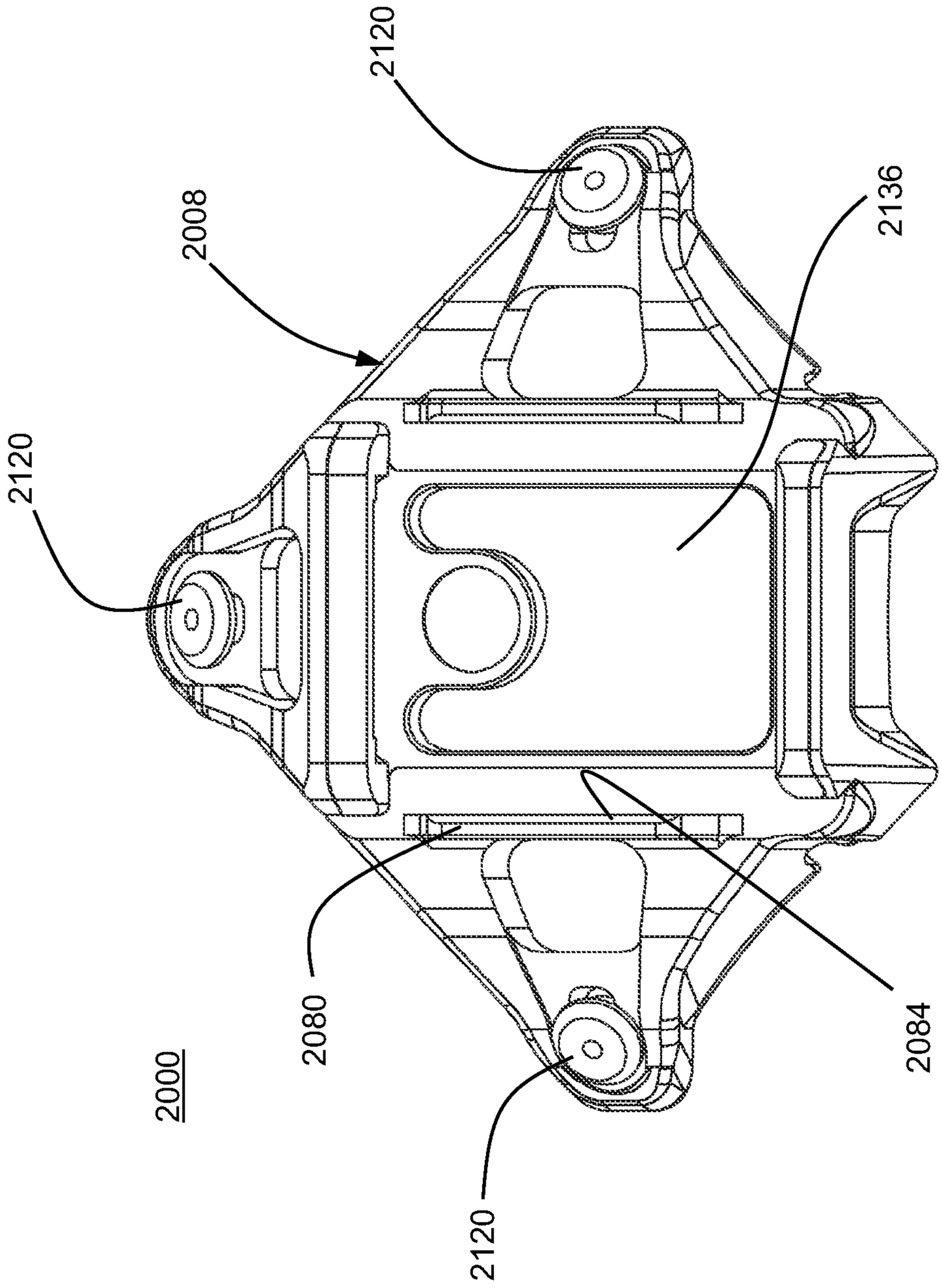


FIG. 14

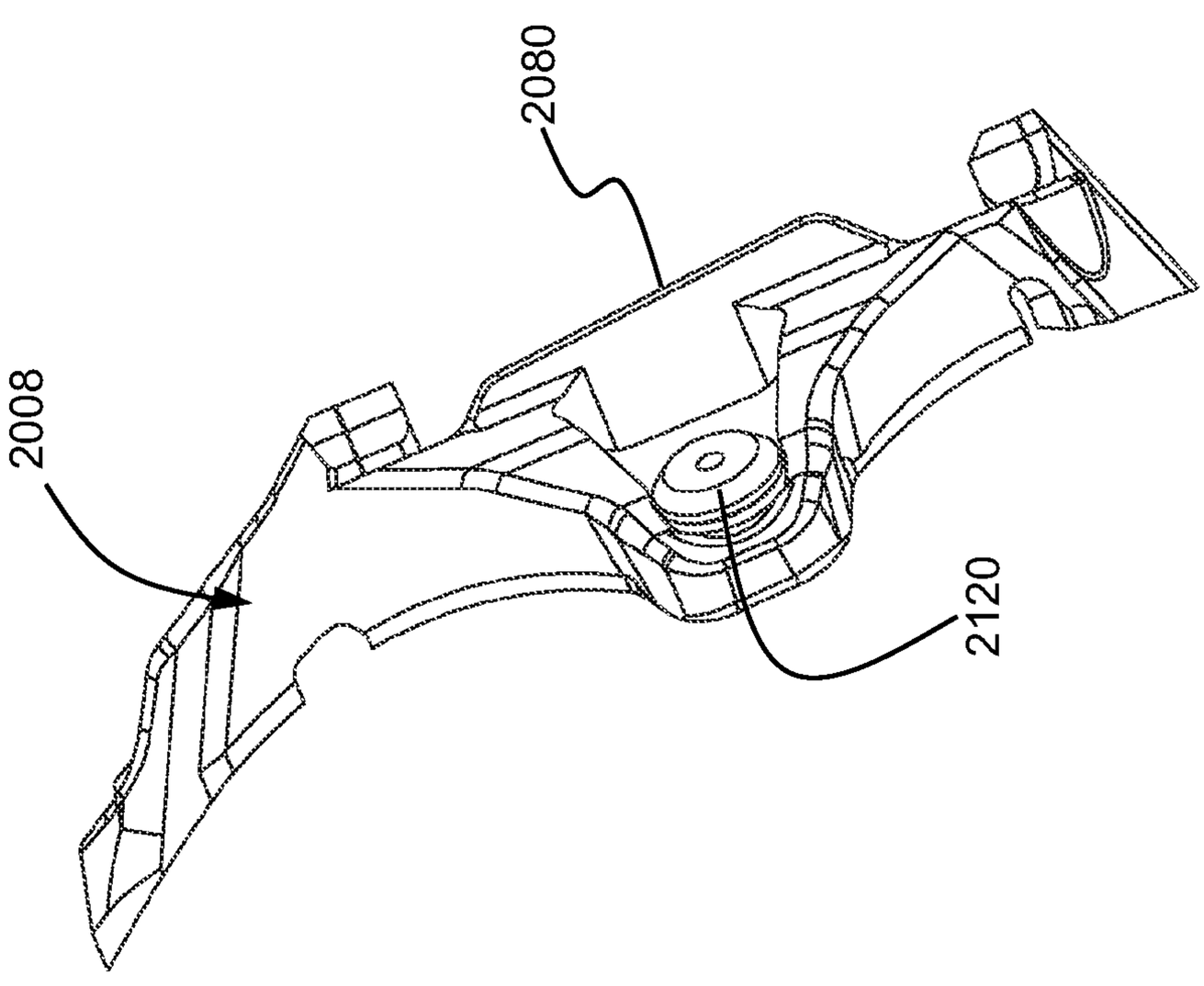


FIG. 15

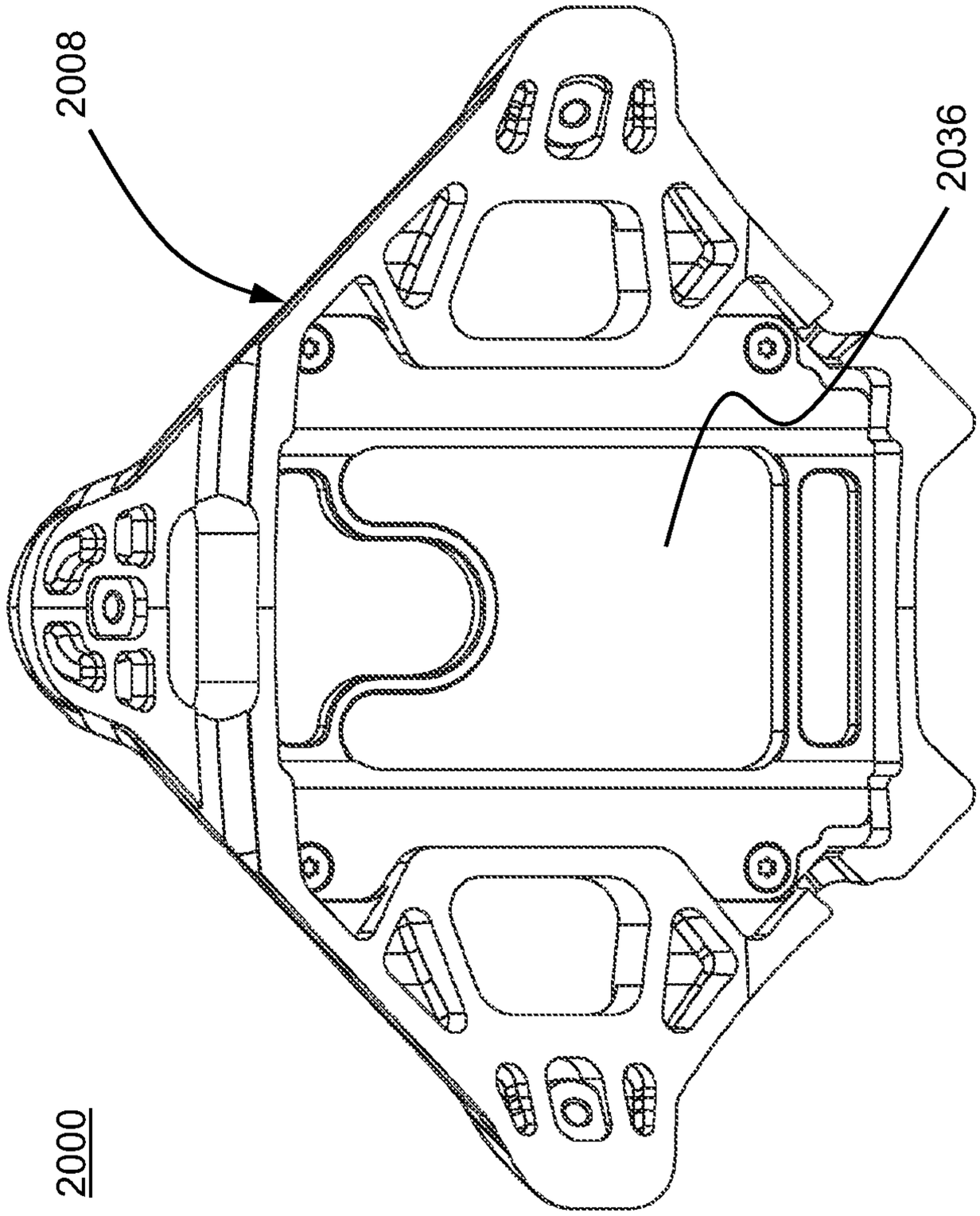


FIG. 16

HEADGEAR SHROUD ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATION

This application claims the priority benefit of U.S. provisional application No. 63/092,140 filed Oct. 15, 2020. The aforementioned application is incorporated herein by reference in its entirety.

INCORPORATION BY REFERENCE

This application is related to U.S. nonprovisional application Ser. No. 15/708,523 filed Sep. 19, 2017, now U.S. Pat. No. 10,264,840; U.S. nonprovisional application Ser. No. 14/483,471, filed Sep. 11, 2014, now U.S. Pat. No. 9,775,395; and U.S. provisional application 61/878,901 filed Sep. 17, 2013. Each of the aforementioned applications is incorporated herein by reference in its entirety.

BACKGROUND

The present invention relates to an improved shroud for mounting an accessory device to headgear. The shroud described herein may advantageously be used in connection with mounting assemblies for attaching night vision devices and will be described herein primarily by way of reference thereto. However, it will be recognized that the shroud herein may be used with all manner of helmet or other headgear mounted accessory devices.

Night vision devices are used by military personnel, law enforcement personnel, and so forth when conducting military or tactical operations at night or under other low light conditions. Commonly, a mounting system is employed on the front of the user's headgear, such as a field helmet, to provide hands free support of the night vision device in front of the eyes of the user. Such helmet mount assemblies typically provide vertical, lateral, fore-and-aft, and tilt adjustment mechanisms for alignment of an attached night vision device with the eye or in the case of a binocular device eyes of the user. Mounting systems are known which allow the user to pivot the night vision device up to a stowed position out of the user's line of sight when not in use without removing the night vision device from the helmet.

Although helmet mounting assemblies are known that allow the user to pivot the night vision device out of the way when the night vision device is not in use, it is often desirable to completely remove the night vision system and the mounting system from the headgear, e.g., during the daytime, in order to reduce helmet weight and strain on the user's neck, in situations where entanglement hazards exist, etc. Commonly, helmet mount assemblies are made removably attachable to a helmet through the use of a mounting bracket or shroud, as described, for example, in commonly owned U.S. Pat. No. 7,219,370. Such shrouds attach to the headgear with threaded fasteners using one or more holes drilled through the helmet. Standardized hole patterns have been developed, such as a single hole pattern compatible with standards of the U.S. Army and a three-hole pattern compatible with standards adopted by the Marine Forces Special Operations Command (MARSOC) and United States Navy Special Warfare Command (WARCOM). The use of standard hole patterns allows helmets to be pre-drilled to accept any shroud compatible with that hole pattern.

Typically, such helmet shrouds are machined using aluminum or other metal and include a receptacle for removable attachment of the mounting assembly. It has been found, however, that the manufacturing tolerances of the prior art shrouds are such that there is generally some clearance between the receptacle of the shroud and the interfacing portion of the mounting system, which results in a small amount of movement or play between the shroud and the mounting assembly. It has also been found that the process of repeated removal and attachment of the night vision mount creates wear, resulting in greater clearance and play between the shroud and the mounting assembly.

The present disclosure contemplates a new and improved shroud assembly that overcomes the above-referenced problems and others.

SUMMARY

In one aspect, a shroud assembly for headgear includes a frame having a first side configured to face toward an exterior surface of the headgear and a second side opposite the first side and configured to face away from the headgear, the first side having a shape that matches a contour of the headgear. A first insert is separately formed from the frame and removably attached to the first side of the frame. The first insert is configured for removable attachment to a mounting assembly. The frame includes first and second spaced apart walls disposed on the front side of the frame on opposite sides of the first insert, the first and second walls spaced a sufficient distance apart to provide an interference fit between the mounting assembly and the first and second spaced apart walls.

In a more limited aspect, the frame has a central opening defining a peripheral edge and the first insert includes a central area received in the central opening and one or more fastening areas extending from the central area. One or more fasteners couple the one or more fastening areas to the first side of the frame adjacent the peripheral edge.

In another more limited aspect, the frame is formed of a material selected from a polymer material.

In another more limited aspect, the frame is formed of an injection moldable thermoplastic resin.

In another more limited aspect, the frame is formed of a fiber reinforced polymer matrix composite material.

In another more limited aspect, the frame is formed of a glass fiber reinforced polyimide matrix composite material.

In another more limited aspect, the first insert is formed of a metal or metal alloy.

In another more limited aspect, the first and second walls extend vertically on opposite lateral sides of the first insert.

In another more limited aspect, the first and second spaced apart walls are flexible.

In another more limited aspect, the first and second walls are configured to be displaced outward when the mounting assembly is removably attached to the first insert.

In another more limited aspect, the first and second walls have a tapered inward facing surface to facilitate insertion of the mounting system.

In another more limited aspect, the first insert defines one or more receptacles configured to removably mate with a latch member of the mounting assembly.

In another more limited aspect, at least one opening in the frame is configured to receive a mechanical fastener for attaching the shroud assembly to the headgear.

In another more limited aspect, first, second, and third openings in the frame are configured to receive a mechanical fastener for attaching the shroud assembly to the headgear.

In another more limited aspect, the first, second, and third openings are positioned in accordance with a promulgated standard for helmet drill hole patterns.

In another more limited aspect, the promulgated standard is a three-hole pattern.

In another more limited aspect, a friction pad is removably attached to the second side of the frame for increasing friction between the shroud assembly and the helmet, wherein the first insert is disposed intermediate the frame and the friction pad.

In another more limited aspect, at least one boss protrudes from the friction pad and extends through a complementary opening in the frame.

In another more limited aspect, a first opening in the first insert, a second opening in the frame, and a third opening in the friction pad, are aligned with an opening in the helmet for receiving a mechanical fastener for attaching the shroud assembly to the helmet.

In another more limited aspect, the position of the first opening corresponds to a military standard helmet single drill hole pattern.

In another more limited aspect, fourth, fifth, and sixth openings are provided in the frame and seventh, eight, and ninth openings are provided in the friction pad, wherein the seventh, eight, and ninth openings are aligned with the fourth, fifth, and sixth openings, respectively. A removable plug is received in each of the seventh, eight, and ninth openings.

In another more limited aspect, each plug has a protrusion extending into a respective one of the fourth, fifth, and sixth openings in the frame.

In another more limited aspect, the fourth, fifth, and sixth openings in the frame are positioned in accordance with a standard helmet drill hole pattern.

In another more limited aspect, the shroud assembly further comprises the mounting assembly, wherein the mounting assembly is a night vision device mounting assembly.

In another more limited aspect, the shroud assembly further comprises a second insert interchangeably attachable to the frame in place of the first insert.

In a second aspect, a helmet assembly comprises a helmet having an exterior surface, the helmet including one or more holes, a left side portion, a right side portion, and a front portion extending between the left side portion and the right side portion. A shroud assembly includes a frame removably attached to the front portion of the helmet and has a first side configured to face toward the exterior surface of the helmet and a second side opposite the first side configured to face away from the helmet. The first side has an interior curve shape that matches an exterior curve shape of the helmet. An insert is separately formed from the frame and removably attached to the first side of the frame. The insert is configured for removable attachment to a mounting assembly for a night vision device. The frame includes first and second spaced apart walls disposed on the front side of the frame on opposite sides of the insert, the first and second walls being spaced a sufficient distance apart to provide an interference fit between the mounting assembly and the first and second spaced apart walls.

In a more limited aspect, the shroud assembly is removably attached to the helmet by one or more fasteners, each of the one or more fasteners extending through a corresponding aligned hole in the helmet and a corresponding aligned hole in the shroud assembly.

In another more limited aspect, the shroud assembly is removably attached to the helmet by fasteners extending through an aligned hole in the helmet and an aligned hole in the insert.

In another more limited aspect, a friction pad is disposed between the helmet and the shroud assembly.

In another more limited aspect, the shroud assembly is removably attached to the helmet by three fasteners, each fastener extending through a corresponding aligned hole in the helmet and a corresponding aligned hole in the frame.

In a third aspect, a method for attaching a mounting assembly to helmet comprises providing a shroud assembly by removably attaching an insert to a first side of a frame. The insert is separately formed from the frame and removably attached to the first side of the frame. The insert is configured for removable attachment to the mounting assembly. The frame has a second side opposite the first side, the first side configured to face toward an exterior surface of the helmet and the second side configured to face away from the helmet. The first side has a shape that matches a contour of the helmet. The frame includes first and second spaced apart walls disposed on the front side of the frame on opposite sides of the insert, the first and second walls spaced a sufficient distance apart to provide an interference fit between the mounting assembly and the first and second spaced apart walls.

In a more limited aspect, the shroud assembly further includes a friction pad removably attached to the second side of the frame for increasing friction between the shroud assembly and the helmet, wherein the insert is disposed intermediate the frame and the friction pad.

In another more limited aspect, the method includes removably attaching a night vision device to the mounting assembly.

One advantage of the present development resides in its ability to prevent relative movement or play between the mounting assembly and the shroud.

Another advantage of the present development is found in the weight reduction that can be achieved by making a portion of the shroud assembly from a polymer material.

Yet another advantage resides in the strengthening of the connection between the frame and the insert.

Still further advantages and benefits of the present invention will become apparent to those of ordinary skill in the art upon reading and understanding the following detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention may take form in various components and arrangements of components, and in various steps and arrangements of steps. The drawings are only for purposes of illustrating preferred embodiments and are not to be construed as limiting the invention.

FIG. **1** is an isometric view of a shroud assembly according to a first exemplary embodiment, attached to a helmet.

FIG. **2** is an enlarged isometric view of the shroud assembly appearing in FIG. **1**.

FIG. **3** is an exploded view of the shroud assembly appearing in FIG. **1** taken generally from the front and side.

FIG. **4** is an exploded view of the shroud assembly appearing in FIG. **1** taken generally from the rear and side.

FIGS. **5** and **6** illustrate a helmet with the shroud assembly appearing in FIG. **1** with a helmet mounting apparatus removably attached (FIG. **5**) and detached (FIG. **6**).

FIG. **7** is a front elevational view of the shroud assembly appearing in FIG. **1**.

FIG. **8** is a left side elevational view of the shroud assembly appearing in FIG. **1**, the right side view being a mirror image thereof.

FIG. **9** is a rear elevational view of the shroud assembly appearing in FIG. **1**.

FIG. **10** illustrates a shroud assembly according to a second exemplary embodiment, attached to a helmet.

FIG. **11** is an enlarged isometric view of the shroud assembly appearing in FIG. **10**.

FIG. **12** is an exploded view of the shroud assembly appearing in FIG. **10**, taken generally from the side and front.

FIG. **13** is an exploded view of the shroud assembly appearing in FIG. **10**, taken generally from the side and rear.

FIG. **14** is a front elevational view of the shroud assembly appearing in FIG. **10**.

FIG. **15** is a left side elevational view of the shroud assembly appearing in FIG. **10**, the right side view being a mirror image thereof.

FIG. **16** is a rear elevational view of the shroud assembly appearing in FIG. **10**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, FIGS. **1-9** illustrate a first embodiment shroud assembly, designated generally as **1000**, for attachment to the front of a helmet **1004**. For the sake of brevity, the present shroud assembly will be described herein primarily by way of reference to use with night vision systems. However, it will be recognized that the present shroud assembly is also amenable for use with all manner of monocular and binocular devices, including optical viewing devices, thermal cameras, head up displays, virtual reality goggles, or other electronic or optoelectronic imaging devices.

The shroud assembly **1000** includes a frame **1008**, an insert **1012** removably attachable to the frame **1008**, and an optional backing pad or friction pad **1016**. The shroud assembly **1000** is primarily intended for use in connection with a helmet **1004** having a single mounting hole, such as the standard one-hole mounting pattern, and will be described primarily by way of reference thereto. It will be recognized, however, that the shroud assembly **1000** could likewise be used with or without the backing pad **1016** with a helmet having holes drilled in a three hole mounting pattern, such as the standard three-hole pattern used by MARSOC and WARCOM, in the same manner as detailed below in connection with the shroud assembly **2000**.

The shroud assembly **1000** provides an interface for the removable attachment of a helmet mount assembly **1020**, such as a night vision mounting system. The helmet mount **1020** assembly may be, for example, a night vision mounting system in the L4 product line available from Wilcox Industries Corp. of Newington, NH It will be recognized that the present shroud assembly can be adapted for use with all manner of helmet mount assemblies by providing an insert **1012** which has retention features complementary with a desired helmet mount assembly. In certain embodiments, the frame may be provided with a plurality of interchangeable metal inserts to provide a modular system capable of being used with multiple types of helmet mounting systems.

The frame **1008** and the friction pad **1016** each have a generally concave rearward surface which is shaped to generally conform to the shape of the helmet **1004**. In certain embodiments, the frame **1008** is formed of a polymer material, although other materials are contemplated. Exemplary polymer materials suitable for forming the frame **1008** include, for example, nylon, polyamide, fiber reinforced polymer composite materials such as glass fiber-filled polyamides, polyethermide (PEI), and polycarbonate (PC). In certain embodiments, the frame **1008** is formed by molding, e.g., injection molding, machining, additive manufacturing, or the like.

In certain embodiments, the insert **1012** is formed of a metal or metal alloy, although other materials are contemplated. Exemplary metal/metal alloy materials suitable for forming the insert **1012** include, titanium, aluminum, e.g., 6000 series aluminum or 7000 series aluminum, preferably 6061-T6 aluminum or 7075-T6 aluminum. In certain embodiments, the insert is formed by machining, molding, e.g., metal injection molding (MIM), additive manufacturing, or the like.

The friction pad **1016** may be formed of natural or synthetic rubber or other elastomer material. The pad **1016** increases the friction between the shroud assembly **1000** and the helmet **1004** and is particularly advantageous for use with a helmet **1004** having a one-hole pattern to prevent rotation of the unit **1000** about the fasteners **1024**, **1028** which secure the shroud assembly **1000** to the helmet **1004**.

The insert **1012** is preferably formed by machining although cast, molded, and additively manufactured inserts **1012** are also contemplated. The insert **1012** is preferably formed of aluminum or aluminum alloy. In the illustrated preferred embodiment, the insert **1012** includes a central portion **1032** having an opening **1036** for receiving the threaded fastener **1024**. The opening **1036** may be elongated in the vertical direction to provide vertical adjustability when mounting the shroud assembly **1000**, e.g., to accommodate differences between the drilled hole placement on the helmet, accommodate edge trim on the brim of the helmet, and so forth.

The threaded fastener **1024** passes through a hole (not shown) in the helmet **1004**, a large central opening **1040** in the friction pad **1016**, and the hole **1036** in the insert **1012**. The fastener **1024** is secured via a complementary threaded fastener or nut **1028** received in a counterbore **1044** of the opening **1036**.

The insert **1012** is disposed on the inward facing (i.e., helmet facing) side of the frame **1008**. The friction pad **1016**, in turn, is disposed on the inward facing (i.e., helmet facing) side of the frame **1008** and friction pad **1016**. The central portion **1032** of the insert **1012** extends into or through a large central opening **1048** in the frame **1008**. In contrast to shrouds having an insert on the exterior side of the frame, wherein the strength of the interface between the frame and insert is defined by the fasteners securing them together, by disposing the insert on the rear side of the frame, the attachment between the frame and the insert becomes stronger in that the interface between the frame and the insert essentially becomes the length of the insert.

The insert **1012** is removably secured to the inward side of the frame **1008** in alignment with the central opening **1048** via one or more threaded fasteners **1052**. The insert **1012** includes a central portion **1032** received in the opening **1048** in frame **1008**. The insert **1012** includes one or more fastening portions **1056** extending from the central portion **1048** that extend beyond the edge of the opening **1032**. The fastening portion(s) **1056** each include an opening **1060** which is aligned with a corresponding opening **1064** on a rear surface of the frame **1008**. The threaded fasteners **1052** pass through the openings **1060** and removably engage the openings **1064**. The insert **1012** includes features, such as an upper recess **1068** and a lower recess **1072**, for removably engaging respective latch members **1076** formed on the mounting system **1020**.

In certain embodiments, the frame **1008** is formed of an injection moldable plastic, such as a thermoplastic resin, although thermosetting polymers are also contemplated. In preferred embodiments, the frame **1008** is formed of a fiber reinforced polymer matrix composite material. Reinforcing fibers for polymer matrix composite materials are generally known. Exemplary fibers include carbonaceous fibers (e.g., carbon or graphite fibers), glass fibers, and other filamentary materials. In an especially preferred embodiment, the frame **1008** is formed of a 30% glass filled polyimide composite material.

A pair of walls or blades **1080** extends from the face of the frame **1008** immediately adjacent the central opening **1048** on opposite lateral sides thereof. In certain embodiments, the blades **1080** are formed of a polymer material that can flex and can therefore be spaced apart a distance that provides a snug, interference fit between the blades **1080** and the sides of an attached helmet mounting system **1020**, even after many insertions and removals of the helmet mounting system. In this manner, side-to-side movement between the mounting system **1020** and the shroud assembly **1000** can be eliminated. This is in contrast to prior art metal shrouds which must be toleranced to provide a clearance fit between the shroud and the mounting system, allowing undesirable side-to-side movement between the shroud and the helmet mount. In certain embodiments, the use of a frame **1008** formed of a polymer provides a reduction of the weight of the shroud assembly **1000** as compared to prior art metal shrouds.

In certain embodiments, the blades **1080** include a tapered or angled surface **1084** on the interior facing side thereof to facilitate insertion of the mounting system **1020** and, where the frame **1008** is formed of a polymer or otherwise flexible material, outward flexing of the blades **1080** is facilitated.

The depicted preferred embodiment illustrates an exemplary shroud assembly adapted for use with a mounting assembly that has latches **1076** that move or provide tension in the vertical direction, such that the blades **1080** are disposed on opposite lateral sides of an attached mounting assembly. Other orientations of the blades **1080**, however, are also contemplated. For example, in the case of a helmet mounting assembly having latch members that move and provide tensioning in a horizontal direction, the flexible blades **1080** could be oriented horizontally above and below the mounting assembly interfacing portion to eliminate up and down movement.

The frame **1008** is of a generally triangular construction and includes three openings **1088** at the corners. The friction pad **1016** is shaped to receive the frame **1008** on the outward facing surface of the friction pad **1016** in a stacked or nested arrangement. The pad **1016** includes three openings **1092** aligned with the openings **1088** at the corners of the frame **1008**. The pad **1016** further includes three bosses or protrusions **1096**, which are disposed intermediate the central opening **1040** and the openings **1092**. When the frame **1016** and the friction pad **1016** are stacked in the assembled, nested configuration, the bosses **1096** extend through aligned openings **1100** in the frame **1008**, to interlock the frame **1008** and the pad **1016** together.

The pad **1016** may include an upstanding peripheral lip or ridge **1104** on the forward facing surface thereof complementary in shape and sized to receive the peripheral edge **1102** of the frame **1008**. The frame **1008** and pad **1016** are further secured via three plugs **1108** at the corners of the unit **1000**. Each plug **1108** includes a base **1112** which is received in one of the openings **1092** in the pad **1016**. Each plug **1108** further includes a protrusion **1116** that extends through a corresponding one of the openings **1088** in the frame **1008**.

In alternative embodiments, the plugs **1108** can be omitted, as well as the central helmet fasteners **1028**, **1040**, wherein the unit **1000** is secured to a helmet having a three-hole pattern, as described below in connection with FIGS. **10-16**. In certain embodiments, the helmet drill/hole pattern may advantageously be the standard three-hole pattern used by MARSOC and WARCOM. It will be recognized that the unit **1000** could also be attached to a helmet using both the central hole **1036** via the fasteners **1024**, **1028** as well as three threaded fasteners (see e.g., fasteners **2120**, **2124** appearing in FIGS. **12** and **13**) using the openings **1088**; however, in general, it is preferable to use only the one hole pattern or the three hole pattern, since unnecessary holes drilled into the helmet can compromise the ballistic integrity of the helmet.

Referring now to FIGS. **10-16**, a second embodiment shroud assembly, designated generally as **2000**, for attachment to the front of a helmet **2004** is illustrated. The shroud assembly **2000** is similar to the embodiment **1000** described above, however, the friction pad is omitted.

The shroud assembly **2000** includes a frame **2008** and an insert **2012**. Because the shroud assembly **2000** is intended for use with a three hole pattern, the insert **2012** need not include a central fastening hole. The frame **2008** and insert **2012** may be formed of materials and via manufacturing methods as described above by way of reference to the frame **1008** and insert **1012** appearing in the embodiment of FIGS. **1-9**. In the illustrated preferred embodiment, an enlarged central opening **2036** is provided in the insert **2012** to reduce the weight of the shroud assembly **2000**, thereby reducing the overall weight on the user's neck. However, the insert **2012** otherwise interfaces with the frame **2008** and a helmet mounting assembly (see, e.g., helmet mounting assembly **1020** appearing in FIGS. **5** and **6**) in the manner as described above.

The mounting features of the insert **2012** may be modified depending on the particular helmet mounting system to be employed. A modular system may also be provided wherein multiple metal inserts **2012** are interchangeable to provide a system capable of being used with multiple types of helmet mounting systems.

The insert **2012** is disposed on the inward facing (i.e., helmet facing) side of the frame **2008**. A central portion **2032** of the insert **2012** extends into or through a large central opening **2048** in the frame **2008**. Again, in contrast to shrouds having an insert on the exterior side of the frame, wherein the strength of the interface between the frame and insert is defined by the fasteners securing them together, by disposing the insert on the rear side of the frame, a stronger the attachment between the frame and the insert is provided in that the interface between the frame and the insert essentially becomes the length of the insert.

The insert **2012** is removably secured to the inward side of the frame **2008** in alignment with the central opening **2048** via one or more threaded fasteners **2052**. The central portion **2032** of the insert **2012** is received in the opening **2048** in frame **2008**. The insert **2012** includes one or more fastening portions **2056** extending from the central portion **2048** that extend beyond the edge of the opening **2032**. The fastening portion(s) each include an opening **2060** which is aligned with a corresponding opening **2064** on a rear surface of the frame **2008**. The threaded fasteners **2052** pass through the openings **2060** and removably engage the openings **2064**. The insert **2012** includes features, such as an upper recess **2068** and a lower recess **2072**, for removably engag-

ing respective latch members **1076** (see FIG. **6**) formed on the mounting system **1020** (see FIGS. **5** and **6**). The frame **2008** may be formed of an injection moldable plastic, and may be formed of the same materials as described above by way of reference to the frame **1008** (see FIGS. **1-9**).

A pair of walls or blades **2080** extends from the face of the frame **2008** immediately adjacent the central opening **2048** on opposite lateral sides thereof. In certain embodiments, the blades **2080** are formed of a polymer material that can flex and can therefore be spaced apart a distance that provides a snug, interference fit between the blades **2080** and the sides of an attached helmet mounting system **1020** (see FIGS. **5** and **6**), even after many insertions and removals of the helmet mounting system. In this manner, side-to-side movement between the mounting system **1020** and the shroud assembly **2000** can be eliminated. This is in contrast to prior art metal shrouds which must be toleranced to provide a clearance fit between the shroud and the mounting system, allowing undesirable side-to-side movement between the shroud and the helmet mount. In certain embodiments, the use of a frame **2008** formed of a polymer provides a reduction of the weight of the shroud assembly **2000** as compared to prior art metal shrouds.

In certain embodiments, the blades **2080** include a tapered or angled surface **2084** on the interior facing side thereof to facilitate insertion of the mounting system **1020** (see FIGS. **5** and **6**) and, where the frame **2008** is formed of a polymer or otherwise flexible material, outward flexing of the blades **2080** is facilitated.

The depicted preferred embodiment illustrates an exemplary shroud assembly **2000** adapted for use with a mounting assembly that has latches **1076** (see FIG. **6**) that move or provide tension in the vertical direction, such that the blades **2080** are disposed on opposite lateral sides of an attached mounting assembly. Other orientations of the blades **2080**, however, are also contemplated. For example, in the case of a helmet mounting assembly having latch members that move and provide tensioning in a horizontal direction, the flexible blades **2080** could be oriented horizontally above and below the mounting assembly interfacing portion to eliminate up and down movement.

The frame **2008** is of a generally triangular construction and includes three openings **2088** at the corners. Threaded fasteners **2120** pass through the openings **2088** and engage complementary threaded fasteners **2124** passing through the helmet **2004** to secure the shroud assembly **2000** to the helmet **2004**. The helmet drill/hole pattern may advantageously be the standard three-hole pattern used by MARSOC and WARCOM.

The invention has been described with reference to the preferred embodiments. Modifications and alterations will occur to others upon a reading and understanding of the preceding detailed description. It is intended that the invention be construed as including all such modifications and alterations insofar as they come within the scope of the appended claims or the equivalents thereof

What is claimed is:

1. A shroud assembly for headgear, comprising:

a frame having a first side configured to face toward an exterior surface of the headgear and a second side opposite the first side and configured to face away from the headgear, the first side having a shape that is configured to match a contour of the headgear, the frame having a central opening defining a peripheral edge;

a first insert separately formed from the frame and removably attached to the first side of the frame, the first insert comprising a generally rectangular body having four sides and four corners, wherein each of the four corners are attached directly to the first side of the frame, the first insert configured for removable attachment to a mounting assembly; and

the frame including first and second spaced apart walls disposed on the second side of the frame on opposite sides of the first insert, said first and second walls spaced a distance apart to provide an interference fit between the mounting assembly and the first and second spaced apart walls,

wherein each of the four corners of the first insert have a fastening portion extending outward from the generally rectangular body, each fastening portion being configured to overlap the peripheral edge of the central opening on the first side of the frame and receive a threaded fastener which is configured to threadably engage a corresponding aligned threaded opening formed on the first side of the frame.

2. The shroud assembly of claim **1**, further comprising:

the first insert comprising a central area received in said central opening; and

one or more fasteners coupling the one or more fastening portions to the first side of the frame adjacent the peripheral edge.

3. The shroud assembly of claim **1**, wherein the frame is formed of a material selected from the group consisting of a polymer material, an injection moldable thermoplastic resin, and a fiber reinforced polymer matrix composite material.

4. The shroud assembly of claim **1**, wherein the frame is formed of a glass fiber reinforced polyimide matrix composite material.

5. The shroud assembly of claim **1**, wherein the first insert is formed of a metal or metal alloy.

6. The shroud assembly of claim **1**, wherein the first and second spaced apart walls extend vertically on opposite lateral sides of the first insert.

7. The shroud assembly of claim **1**, wherein the first and second spaced apart walls are flexible.

8. The shroud assembly of claim **1**, wherein the first and second spaced apart walls are configured to be displaced outward when the mounting assembly is removably attached to the first insert.

9. The shroud assembly of claim **1**, wherein each of the first and second spaced apart walls have a tapered inward facing surface to facilitate insertion of the mounting system.

10. The shroud assembly of claim **1**, further comprising one or both of:

said first insert defining one or more receptacles configured to removably mate with a latch member of the mounting assembly; and

at least one opening in the frame configured to receive a mechanical fastener for attaching the shroud assembly to the headgear.

11. The shroud assembly of claim **1**, further comprising:

first, second, and third openings in the frame, each of the first, second, and third openings configured to receive a mechanical fastener for attaching the shroud assembly to the headgear.

12. The shroud assembly of claim **11**, wherein the first, second, and third openings are positioned in a pattern which corresponds to a three-hole drill hole pattern on a helmet.

13. The shroud assembly of claim **1**, further comprising:

a friction pad removably attached to the second side of the frame for increasing friction between the shroud assem-

bly and the helmet, wherein the first insert is disposed intermediate the frame and the friction pad.

14. The shroud assembly of claim **13**, further comprising:

at least one boss protruding from the friction pad and configured to extend through a complementary opening in the frame.

15. The shroud assembly of claim **13**, further comprising a first opening in the first insert, a second opening in the frame, and a third opening in the friction pad, wherein the first, second, and third openings are aligned with an opening in the helmet for receiving a mechanical fastener for attaching the shroud assembly to the helmet.

16. The shroud assembly of claim **15**, wherein the position of the first opening corresponds to a single drill hole pattern.

17. The shroud assembly of claim **15**, further comprising:

fourth, fifth, and sixth openings in the frame;

seventh, eighth, and ninth openings in the friction pad, the seventh, eight, and ninth openings aligned with the fourth, fifth, and sixth openings, respectively; and

a removable plug received in each of the seventh, eighth, and ninth openings.

18. The shroud assembly of claim **17**, wherein each plug has a protrusion configured to extend into a respective one of the fourth, fifth, and sixth openings in the frame.

19. The shroud assembly of claim **17**, wherein the fourth, fifth, and sixth openings in the frame are positioned in a pattern which corresponds to a three-hole drill hole pattern on a helmet.

20. The shroud assembly of claim **1**, further comprising the mounting assembly removably attached to the first insert, wherein the mounting assembly is a night vision device mounting assembly.

21. The shroud assembly of claim **1**, further comprising a second insert interchangeably attachable to the frame in place of the first insert.

22. A helmet assembly comprising:

a helmet having an exterior surface, the helmet including one or more holes, a left side portion, a right side portion, and a front portion extending between the left side portion and the right side portion;

a shroud assembly including a frame removably attached to the front portion of the helmet and having a first side configured to face toward the exterior surface of the helmet and a second side opposite the first side and configured to face away from the helmet, the first side having an interior curve shape that matches an exterior curve shape of the helmet, the frame having a central opening defining a peripheral edge;

the shroud assembly further including an insert separately formed from the frame and removably attached to the first side of the frame, the first insert comprising a generally rectangular body having four sides and four corners, wherein each of the four corners are attached directly to the first side of the frame, the insert configured for removable attachment to a mounting assembly for a night vision device; and

the frame including first and second spaced apart walls disposed on the front side of the frame on opposite sides of the insert, said first and second walls spaced a distance apart to provide an interference fit between the mounting assembly and the first and second spaced apart walls,

wherein each of the four corners of the first insert have a fastening portion extending outward from the generally rectangular body, each fastening portion being configured to overlap the peripheral edge of the central opening on the first side of the frame and receive a threaded fastener which is configured to threadably engage a corresponding aligned threaded opening formed on the first side of the frame.

23. The helmet assembly of claim **22**, wherein the shroud assembly is removably attached to the helmet by one or more fasteners, each of said one or more fasteners extending through a corresponding aligned hole in the helmet and a corresponding aligned hole in the shroud assembly.

24. The helmet assembly of claim **22**, wherein the shroud assembly is removably attached to the helmet by fasteners extending through an aligned hole in the helmet and an aligned hole in the insert.

25. The helmet assembly of claim **24**, further comprising a friction pad disposed between the helmet and the shroud assembly.

26. The helmet assembly of claim **22**, wherein the shroud assembly is removably attached to the helmet by three fasteners, each fastener extending through a corresponding aligned hole in the helmet and a corresponding aligned hole in the frame.

27. A method for attaching a mounting assembly to a helmet, comprising:

providing a shroud assembly by removably attaching an insert to a first side of a frame, the frame having a central opening defining a peripheral edge, the insert separately formed from the frame and removably attached to the first side of the frame, the insert comprising a generally rectangular body having four sides and four corners, wherein each of the four corners are attached directly to the first side of the frame, the insert configured for removable attachment to the mounting assembly, the frame having a second side opposite the first side, the first side configured to face toward an exterior surface of the helmet and the second side configured to face away from the helmet, the first side having a shape that matches a contour of the helmet; and

the frame including first and second spaced apart walls disposed on the front side of the frame on opposite sides of the insert, said first and second walls spaced a sufficient distance apart to provide an interference fit between the mounting assembly and the first and second spaced apart walls,

wherein each of the four corners of the first insert have a fastening portion extending outward from the generally rectangular body, each fastening portion being configured to overlap the peripheral edge of the central opening on the first side of the frame and receive a threaded fastener which is configured to threadably engage a corresponding aligned threaded opening formed on the first side of the frame.

28. The method of claim **27**, wherein the shroud assembly further includes a friction pad removably attached to the second side of the frame for increasing friction between the shroud assembly and the helmet, wherein the insert is disposed intermediate the frame and the friction pad.

29. The method of claim **27**, further comprising:

removably attaching a night vision device to the mounting assembly.

* * * * *